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# Impact of sociodemographic determinants on control in hypertension patients: A community pharmacy-based cross-sectional study

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## ABSTRACT

**Background:** Hypertension is one of the significant public health issues around the globe. Controlling blood pressure is imperative to stop the progression of hypertension in complicated cardiac problems. Sociodemographic determinants directly affect the control of hypertension in patients. **Objective:** This study determined the sociodemographic determinants of hypertension in patients to control hypertension. **Methods:** This cross-sectional observational study determined the effect of sociodemographic determinants on the control of hypertension. A self-prepared and validated data collection tool was utilized to collect the data. Statistical Package for Social Science (SPSS) ver. 24.0 was used to analyze the data. Multiple logistic regression was used to discover the association of these determinants on control of blood pressure. **Results:** A statistically significant association was observed ( $p < 0.005$ ) between the control of blood pressure and gender of the patients. Enhanced blood pressure control was observed in the female patients 76.9% COR 1.446 (0.52-2.97). Adherence of patients towards the medication was also observed to be in significant association with the control of blood pressure (COR = 0.271,  $p < 0.004$ ), similarly a strong significant association was observed in the patients of hypertension receiving two drugs' combinations (COR = 6.118,  $p < 0.001$ ) for the treatment and patient education was also directly associated with the control of blood pressure (COR = 1.548,  $p < 0.001$ ). **Conclusion:** In conclusion, patient adherence is a crucial determinant in the present study and a patient's commitment to following prescribed guidelines leads to improved hypertension control.

**Keywords:** Sociodemographic factors influencing hypertension, confounding variables, elements affecting hypertensive patients, and management of hypertension control.

## 1. INTRODUCTION

Hypertension (HTN) is developing as one of the world's most serious public health issues, affecting 1.4 billion adults worldwide, with men being somewhat more affected (Mills et al., 2020). Patients with HTN are twice as likely to develop coronary artery disease, four and seven times more likely to experience congestive heart failure and cerebrovascular disease respectively compared to normotensive patients (Rapsomaniki et al., 2014). One-quarter of the world's adult population is hypertensive and it is estimated that by 2025 this figure is likely to increase to 29% (le-Roux et al., 2021). Rational prescription patterns are defined as patients receiving medications according to their medical condition, in doses that meet their requirements, for an adequate period of time and at affordable cost to them and the society (Dessie et al., 2020). Appropriate prescribing has a positive implication on medication adherence and disease improvement (Piña et al., 2021).

Prescribing trends define the nature and profile of drug usage, patterns and compliance with regional, state or national guidelines, such as uniform prescribing instructions, the use of drugs from the list of essential medicines and the use of generic drugs (Ahmed et al., 2021). Appropriate prescription has a beneficial effect on adherence and disease prevention. Irrational prescription trend happens when an excessive dose, frequency and duration of an antihypertensive medication is prescribed (Atal et al., 2021). Inappropriate delivery of drugs may also result in additional costs incurred by the patient due to inefficient treatment and adverse drug reactions (Dessie et al., 2020). Elderly people are typically vulnerable to adverse drug reactions due to overdose, as their medication excretion and metabolic organs have been atrophied with aging over time (Al-Qudah et al., 2020). Many determinants have direct relation with control of blood pressure in a patient but still impact of various social determinants are not well established in relation to hypertension control in patients (Doyle et al., 2019).

Social demographics can vary from one country to another that can have direct effect on hypertension (Teo and Rafiq, 2021). Research carried out since the mid-20th century all over the globe established the triggers and risk factors that are responsible and have established individual factors for life style modification diseases such as hypertension, diabetes and dyslipidemia followed by others (Park et al., 2020). Pakistan has a high rate of urbanization, where individuals consume a diet high in salt, calories and saturated fat which is reduced intake of fruits and vegetables (Yan et al., 2023). Several studies hypothesized that these changes contribute to a higher prevalence of hypertension in urban areas as compared to rural population (Chantakeeree et al., 2022; Zhang et al., 2019). The effect of different sociodemographic determinants on the control of blood pressure has not been rigorously studied in Pakistan in the outpatient setting. The present study is particularly aimed to compare the impact of different sociodemographic determinants of patients upon blood pressure control in Lahore, Pakistan.

## 2. MATERIALS AND MATERIALS

The current study is a multicentered study conducted in Lahore, which is one of the famous cities of Punjab, Pakistan. This cross-sectional observational study used a validated data collection tool for taking response from patients at different community pharmacies. This study lasted seven months, from December 2, 2022, to June 2, 2023. The main aim of the study was to evaluate the impact of different demographic determinants on hypertension control in hypertension patients who were taking anti-hypertensive drugs continuously over a long period of time from different pharmacies in Lahore. In prescription, current study investigated effect of various demographics on control of hypertension e.g., the type of therapy they followed (monotherapy, dual therapy and triple therapy) and the effect of drug on the patient's blood pressure (controlling the blood pressure in the patient or not). This information was gathered from community pharmacies where patients came to buy medications as prescribed by physician. In community pharmacies, patients come with prescriptions from different hospitals and clinics.

Initially, the current study aimed for a minimum sample size of 50 patients for this study. However, in order to achieve a more robust level of significance, we ultimately enrolled a total of 134 patients. The prescriptions of patients who have had hypertension for more than one year were selected for this study. The minimum age of a patient was selected as 20 years. Patients weighing less than 40

were not selected. Pregnant women were not included in this study. Patients who were not willing to participate in this study were excluded. Information was gathered using a comprehensive data collection form, which encompassed patient demographics, social attributes, family and medical history, blood pressure as per American Heart Association guidelines, symptoms, type of therapy, and medication details for treatment. Data collection was done by the investigators and all of them are registered pharmacists in Pakistan. All the pharmacies were randomly selected by researchers. Pharmacists provided basic information regarding the research project. Each eligible pharmacy received a mandatory statement and consent form.

Clear explanations were provided for each query. Following ethical approval, the significance and implications of the study were communicated to each eligible subject. Subsequently, consent was obtained from the selected study participants, and the ethical considerations of the study were reiterated. A minimum of five prescriptions were collected from each community pharmacy. All necessary Data was collected on data collection form at the time of interview of patients. All those patients who had essential hypertension and a complete medication record, including their age, race, gender, family history, material status and medical history (past and current) were asked to take the consent. The ethical approval of this study was obtained from Lahore Pharmacy College, Lahore Pakistan with ethical approval number (ref: ZI/06/22). Hypertension assessment involved researchers performing a blood pressure test on the spot using a sphygmomanometer. This test included measuring the systolic and diastolic pressure of the heart. Based on the reading, hypertension was classified into controlled and uncontrolled according to the American Heart Association's criteria on Blood pressure.

Statistical analysis

The data of the study subjects are expressed as a mean ± standard deviation. SPSS v25.0 was used for the analysis of this study's data. A P-value greater than 0.05 was indicated as statistically significant. Regression analysis served as an employed statistical approach to investigate the correlation between a single dependent variable and one or multiple independent variables. Its purpose is to create a model that captures and quantifies the relationship between these variables, facilitating the prediction or estimation of the dependent variable based on the values of the independent variables. Regression analysis was utilized to analyze the data statistically in current study.

3. RESULTS

A total of 134 patients of hypertension from different community pharmacies agreed to participate in the study. Table 1 shows the socio-demographic details of the respondents. In terms of gender, a greater number of male patients participated in this study as compared with females. The marital status of the respondents was varied, and a greater number of divorced patients were present in the study i.e., 70 (52.2%). The demographic information of the patients can be seen in (Table 1).

Researchers observed how various confounding factors influenced hypertension control in patients. The multiple logistic regression was used to find out the association between different confounders and control of hypertension in current study. Better control of blood pressure was observed in patients without any co-morbidities which was 79.5%. Patient adherence was another confounder which shows better control of patient's blood pressure i.e., 79.2%. Conversely, patient education also significantly influences blood pressure control, accounting for 91.7% of the impact. The impact of different confounders can be well displayed in our (Table 2).

Table 1 Represents the demographic information of the patients.

Gender	
Male	69 (51.5)
Female	65 (48.5)
Comorbidity	
Yes	56 (41.8)
No	78 (58.2)
Married Status	
Single	22 (16.4)
Married	33 (24.4)

Divorced	70 (52.2)
Widowed	9 (6.7)
Patient Adherence as prescribed	
Yes	77 (57.5)
No	57 (42.5)
Daily Exercise	
Yes	82 (61.2)
No	52 (38.8)
Number of antihypertensive drugs	
One drug	74 (55.2)
Two drugs	30 (22.4)
Three drugs	30 (22.4)
Parents' Education	
Pre-College	62 (46.3)
College	35 (26.1)
University	37 (27.6)
Healthcare Professionals in Family	
Yes	81 (60.4)
No	53 (39.6)

The relationship between the age of patients and hypertension is depicted in (Figure 1). It is evident from the figure that as age increases, the prevalence of hypertension worsens. Both Stage 1 and Stage 2 hypertension patients are more prevalent in the age group ranging from 40 to 80 years, as illustrated in the figure.

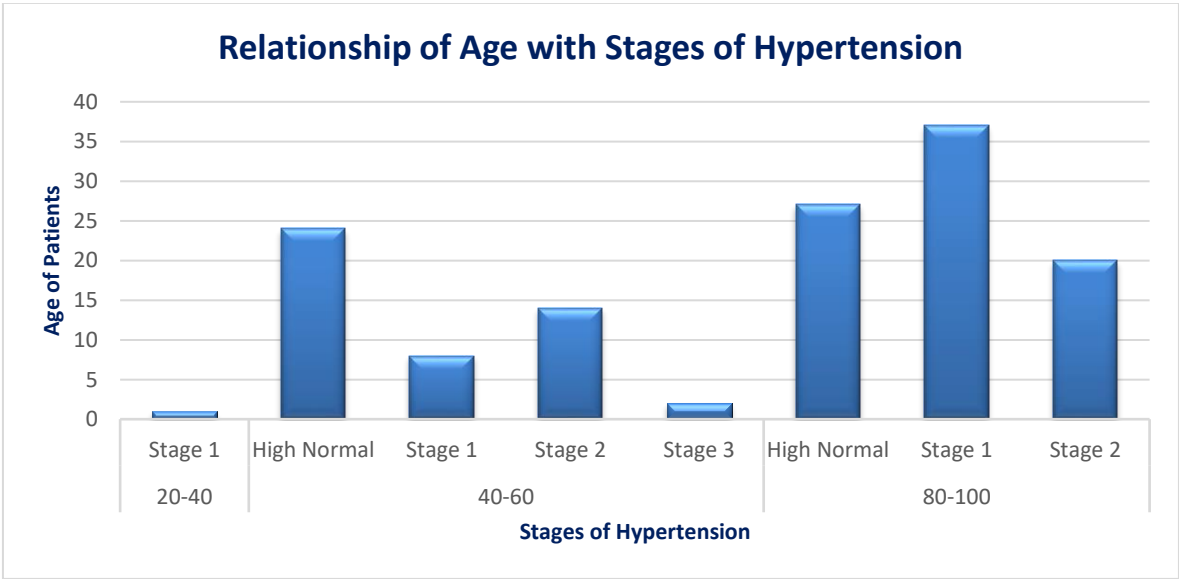


Figure 1 Relationship of age of patients with stages of hypertension

**Table 2** Predictors and their association with blood pressure control (n =134).

Variables	Blood Pressure status (N %)		Univariate Analysis		Multivariate Analysis	
	Control	Uncontrol	COR (95% CI)	P-value	AOR (95% CI)	P-value
Gender						
Male	31 (44.9)	38 (55.1)	Referent	-	Referent	-
Female	50 (76.9)	15 (23.1)	1.446 (0.52–2.97)	<0.001	1.096 (0.67–8.53)	<0.001
Comorbidity						
Yes	19 (33.9)	37 (66.1)	Referent	-	Referent	-
No	62 (79.5)	16 (20.5)	1.576 (0.78–2.51)	<0.001	1.061 (0.24–3.91)	<0.001
Married Status						
Single	17 (77.3)	5 (22.7)	Referent	-	Referent	-
Married	15 (45.5)	18 (54.5)	1.326 (2.44–4.23)	<0.001	3.489 (0.32–10.87)	0.215
Divorced	45 (64.3)	25 (35.7)	1.457 (2.56–7.96)	<0.001	2.758 (0.69–6.42)	<0.001
Widowed	4 (44.4)	5 (55.6)	1.641 (2.66–9.12)	<0.001	1.027 (0.89–6.71)	<0.001
Patient Adherence as prescribed						
Yes	61 (79.2)	16 (20.8)	Referent	-	Referent	-
No	21 (35.1)	37 (64.9)	0.271 (0.37–0.12)	0.004	3.489 (0.71–9.91)	0.127
Daily Exercise						
Yes	73 (89.0)	9 (11.0)	Referent	-	Referent	-
No	8 (15.4)	44 (84.6)	3.489 (1.12–3.52)	<0.001	3.489 (1.12–3.52)	<0.001
Number of antihypertensive drugs						
One drug	36 (48.6)	38 (51.4)	Referent	-	Referent	-
Two drugs	23 (76.7)	7 (23.3)	6.118 (2.96–7.14)	<0.001	2.321 (2.32–4.82)	<0.001
Three drugs	22 (73.3)	8 (26.7)	5.413 (2.15–6.16)	<0.001	3.885 (2.42–5.61)	<0.001
Parents' Education						
Pre-College	29 (46.8)	33 (53.2)	Referent	-	Referent	-
College	23 (91.7)	12 (8.3)	2.328 (3.76–6.21)	<0.001	3.489 (1.12–3.52)	<0.001
University	29 (78.4)	8 (21.6)	1.548 (2.85–3.86)	<0.001	2.345 (7.28–9.62)	<0.001
Healthcare Professionals in Family						
Yes	64 (79.0)	17 (21.0)	Referent	-	Referent	-
No	17 (32.1)	36 (67.9)	2.012 (1.64–4.99)	<0.001	2.191 (7.54–8.99)	0.009

COD=Crude Odds Ratio, AOD=Adjusted Odds Ratio, CI=Confidence Interval

#### 4. DISCUSSION

Patients can achieve effective blood pressure control by adhering to prescribed drug therapy, which may involve following proper dosage regimens and practicing self-care measures (Rapsomaniki et al., 2014). Taking care of all the confounding factors will result in better control of blood pressure in patients. In the present study, all confounders associated with blood pressure were assessed. The findings reveal that a higher proportion of females (75.9%) exhibit good blood pressure control compared to males (44.9%). A significant association ( $p<0.001$ ) was observed between the gender of patients and the control of blood pressure when it comes to a univariate analysis upon finding the crude odds ratio 1.446 (0.52–1.97) and the same can be presented in a multivariate analysis when adjusted odds ratio was calculated 1.096 (0.67–8.53). The possible reason behind these results could be the sensitive nature of females regarding their health and diet as compared to the males. However, the findings of current study are different with a study conducted in Canada in 2020 according to which the good blood pressure control was 22% in females and 28% in males;  $p<0.0001$  (Walli-Attai et al., 2020).

A better control of hypertension was observed in patients without comorbidities (79.5%) as compared to those having comorbidities (33.9%). In regression analysis, both univariate analysis 1.576 (0.78-2.51) and multivariate analysis 1.061 (0.24-3.91) shows a significant relationship ( $p<0.001$ ) between the presence of comorbidities and blood pressure control in patients. The possible reason behind could be the complex treatment for the patients having comorbidities as compared to those who are not having any comorbid condition with hypertension. These study findings are well supported with a study conducted by which states that in the absence of any comorbidity, the blood pressure of patient can be a well-controlled and monitored (Kamyshnyi et al., 2020). Similarly, marital status also has a significant relation ( $p<0.001$ ) with the control of blood pressure in current study participants. Single (77.3%) and divorced patients (64.3%) are having better control on blood pressure as compared to the others in same group.

The findings of current study prove that patient adherence is directly related with control of blood pressure in a patient of hypertension. Patients with adherence to the given regimen of a treatment is having a control of 79.2% whereas, in the absence of patient compliance the control was only 35.1%. A good association was observed in a univariate analysis 0.271 (0.37-0.12), however according to multivariate analysis, while calculating adjusted odds ratio this percentage was decreased with the  $p$ -value of 0.127. Similarly, a strong association was observed when the patient was assessed in the presence of exercise with blood pressure control thus it is proven that control of blood pressure is directly related with the daily activities. These study results are well supported with literature where a study was conducted in Italy in 2021 which proves that there is a direct relation of exercise with blood pressure control as well as enhanced adherences will always result in a better control of blood pressure (Parati et al., 2021).

A good control of blood pressure was observed with a combination therapy of two drugs together (76.7%) followed by three drugs together (73.3%) and least control was observed when single drug (48.6%). A strong positive association was observed between the number of anti-hypertensive drugs prescribed with the blood pressure status, when calculating univariate analysis, the association was stronger 6.118 (2.96-7.14)  $p<0.001$ . However, this association becomes weak when calculating the adjusted odds ratio 2.321 (2.32-4.82). This indicates that combination therapy is more effective as compared to monotherapy regarding pressure control in a hypertension patient. These findings of our study are quite similar and well supported with a review conducted on the treatment plan of hypertension by Mancina et al., (2017) in which some of the original research studies proved that the impact of combination therapy is better in control of hypertension as compared to monotherapy.

Furthermore, these findings are also supported by another review conducted in Canada which proves that a combination therapy is more effective as compared to a monotherapy when treatment is given to the hypertension patients (Ruzicka and Leenen, 2001). Patient education also has a good relationship with blood pressure control. A patient having an education until college level (91.7%) and university level (78.4%) have a better control of hypertension as compared to the patients with pre-college level education. The most probable reason behind this could be the awareness of patients when they are having a good education background towards the control of hypertension and its pros and cons (Hacihasanoglu and Gözümlü, 2011).

These findings of the current study are also supported by another randomized controlled trial conducted in Canada according to which the patient education has a direct relation with the control of hypertension (Dawes et al., 2010). The presence of healthcare providers within a family significantly influences the blood pressure control of patients. When a healthcare provider is available in the family, blood pressure control can increase up to 79%. Conversely, in the absence of any healthcare provider in the family, blood pressure control may decrease to only 32.1%. A strong positive association was observed between the blood pressure control and presence of healthcare provider in a family when calculated crude odds ratio 2.012 (1.64-4.99) and thereafter adjusted odds ratio 2.191 (7.54-8.99).

The presence of health care provider effects are on the knowledge of respondents and it was well studied in a study conducted in Malaysia by Iqbal et al., (2020) according to which the presence of healthcare provider in the family will have an impact on knowledge of patients regarding mental health disorders. Similarly, another study conducted in Malaysia proves that the presence of healthcare provider also improves the knowledge of respondents on oral health treatments (Iqbal et al., 2020). Thus, our study results supported with literature proves that whenever we are talking about any disease, the presence of health care provider in the family will always have a positive effect on knowledge of respondents about that disease.

## 5. CONCLUSION

This study provides insights into the relationship between sociodemographic determinants and control of hypertension in a hypertensive patient. The main important determinant in current study is patient adherence where it is proved that adherence of a patient will result in a better control of hypertension. Similarly, more exercise and physical activity will result in better control of hypertension. Moreover, patient education also has a direct relation with control of hypertension.

### Limitations of the study

This study was only done in selected pharmacies which were visited by patients from a few clinics and hospitals for the refill of prescriptions. A detailed follow-up study can be done to evaluate the overall impact of sociodemographic determinants hypertension patients, all over the Pakistan for hypertension patients.

### Authors' Contributions

This work was carried out in collaboration among all authors. Authors MZI, NM, AI and MA, designed the study, performed the initial statistical analyses and wrote the protocol. Authors MZI, MA, AAS, AN collected the data. Authors SS, AAS, AN, MUL, and MZI wrote the first draft of the manuscript. Authors MZI, NM and AZ managed refined analyses. Authors MUL, AI, MI and SS revised the manuscript. All authors read and approved the final manuscript.

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### Ethical Approval

The study was approved by the Medical Ethics Committee of Lahore University of Biological & Applied Sciences, Lahore, Pakistan with the ethical approval number (ref: ZI/06/22).

### Informed Consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

### Abbreviations

COD- Crude Odds Ratio

AOD- Adjusted Odds Ratio

95% CI- 95% Confidence Interval

SPSS- Statistical Package for the Social Sciences

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This study has not received any external funding.

### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.



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